

THE LIFE-HISTORY OF THE FLORIDA FORM OF EUCLEA DELPHINII.

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(Plate V, Figs. 1-13.)

Larvæ found at Lake Worth, Florida, in January, 1896, differed from any previously seen by me, and were supposed to represent some species of *Euclea* or *Monoleuca* not previously bred. However, the moths which emerged proved to be *E. delphinii*. I present herewith an account of their life-history in advance of that which Miss Morton and I will work out of the New York form, since I have been fortunate enough to observe all the stages. I am much indebted to Mr. F. Kinzel, of Palm Beach, for a supply of food plants during the winter months.

The larvæ are nearest in pattern and structure to the form provisionally called *E. pænulata (elliottii)* by Miss Morton and myself (Journ. N. Y. Ent. Soc., III, 146). They differ in coloration and in having a pair of caltrop patches on the subdorsal horns of joint 13, which are absent in *pænulata*. In both there is a single group of detachable spines and the subdorsal line is unbroken by discoloured patches. The synonymy and relations of the several forms of the *delphinii* group, as well as figures of the caltropes and spines will be deferred to our paper on the New York species, where we hope to discuss these matters in full.

SPECIAL STRUCTURAL CHARACTERS.

Dorsal and lateral spaces broad, subventral space narrow, contracted; ridges very slight, the lateral the most distinct, approximate to the subventral. Fleshy horn-like processes unequally elongated; in stage I bearing primitive setæ; after first molt the subdorsal and lateral rows covered with numerous urticating spines, mixed with less developed spines bearing setæ; subventral row rudimentary. The subdorsal horns are well developed on joints 3 to 5 and 11 to 13, moderate on joint 8, very small on 6, 7, 9 and 10, but none are rudimentary as they are in *Sibine*. Of the lateral row the one on joint 5 is absent.

Depressed areas feebly developed, usually only their pale glandular centers visible, under favorable circumstances also the areas themselves as slight hollows, smoother than the general surface; dorsal row (1) paired, double between joints 3-4 and 4-5, ad-dorsal (2) slight;

the lateral row (4) and lower intersegmental lateral (6) quite distinct, the former reniform.

Skin at first smooth, in the later stages covered with minute clear, conical granules, rather sparsely distributed. These little granules are intermediate in development between the sharp-pointed skin spines of *Sibine* and the low, rounded, smooth, colorless granules of *Apoda*. They are not present on any of the horns, which are armed only with the spines and setæ. Caltrop patches appear toward the tip of the horns of the lateral row at about stage VII. They are present on joints 6 to 12 and also on the subdorsal horn of joint 13. In the last stage a single pair of detachable spine patches appears, situated above the subdorsal horn of joint 13, the patch small, slender, obliquely truncate.

The coloration is on the whole mimetic and adapted to escape observation. These larvæ persistently hide by day in their native habitat, creeping into curled leaves or any other similar protected place on their food plant.

The larva is closely comparable with *Sibine* (Journ. N. Y. Ent. Soc., IV, 2), on the whole slightly less specialized, as seen by the smaller and imperfectly developed detachable spines and the less unequally developed horns. Its skin structure is, however, considerably higher than that of *Sibine*.

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Eggs.—Laid singly, or in patches of two to seven, slightly overlapping. Flattened, the upper surface low arched, elliptical, but not of a constant shape; $1.6 \times .9 \times .2$ mm., or about these dimensions, varying in thickness as well as in outline. Nearly transparent as seen on the leaf, milky whitish on glass, and pale lemon yellow on white paper, shining; reticulations obscure, narrow, linear, angularly 4 to 6-sided areas, only seen in a strong direct light. The eggs hatch in seven days from the time they are laid.

Stage I.—The embryo forms as usual curved ventrally, flattened laterally, the head and tail touching. Before hatching it shortens and thickens slightly, but still well compressed, and emerges through a hole at the top of the egg. Head pale with a large black eye; width about .2 mm, retracted beneath joint 2, which may be partly retracted below joint 3. Body rather square, the horns all present as described for the mature larva, but the short ones relatively longer (Plate V, Fig. 1). The arrangement is as in *Sibine* and is shown on the plate. The subdorsal horn on joint 8 is only partially reduced in size. There is a tendency

for the smallest horns to be crowded toward the neighboring large ones, whereby the subdorsal horn on joint 6 approaches the one on 5, that on 7 the one on 8, etc. Setæ rather long, stiff, sharp pointed, three from the apex of each horn. Cuticle perfectly smooth, transparent. The larva is pale yellowish, the color of the egg, without marks. It does not feed at all in this stage, becoming quiescent immediately after hatching and molting in three days. Length of larva 1 mm.

Stage II.—Subdorsal horns on joints 3 to 5, 8, 11 and 12 large, rounded, bristly with stiff, black-tipped spines; those on joints 6, 7, 9 and 10 very small, rounded, each with one spine; lateral row with many spines, the horns on joints 3 and 4 larger than the rest. Body squarish, ridges marked by the large tubercles, widest through joints 3 and 4. All pale yellowish white, much more opaque than before. Skin finely granular dotted; no marks. Head pale, eye black, mouth brown, width .3 mm. Toward the end of the stage the horns of subdorsal row on joints 4, 5 and 11 become brick red in some examples. Length 1 to 2 mm.

Stage III.—Very shining, green, but principally from the alimentary canal showing by transparency. A narrow, faint yellow subdorsal line along the ridge; horns on joints 3 to 5, 8, 11 and 12 bright red; lateral row colorless with green tips. The horns are moderately well covered with black-tipped spines; the subdorsal ones on joints 6, 7, 9 and 10 have only one or two spines. Skin finely and rather remotely watery granular. Dorsal and ad-dorsal depressed areas indicated by whitish dots, also the large lateral intersegmental (4). The larvæ eat rounded patches on either side of the leaf (Plate V, Fig. 13). Width of head .4 mm.; length of larva 2 to 3.3 mm.

Stage IV.—Resembles the mature larva in shape and appearance. Green, a narrow yellow subdorsal line, the same horns red as before. The subdorsal horns on joints 6 and 10 are very small with three or four spines, those on joints 7 and 9 moderate with six to eight spines. A narrow pale dorsal line. Double intersegmental dorsal, ad-dorsal and two lateral obliquely set rows of white glandular dots. The lateral horn on joint 4 is a little larger than the others. Head whitish, the eye black; width .6 mm. Skin granules rather remote, concolorous or colorless, non-setiferous, conical but not sharp pointed, about .005 mm. in diameter. All the horns are smooth, without skin granules. No trace of caltropes. Length of larva 3.3 to 5.3 mm.

Stage V.—Head shining, very pale greenish, eye black, mouth brown; width .8 mm. Green; the skin transparent with a faint green

tint from the blood, the effect increased by some bright green pigment, not evenly distributed. In the dorsal space it is absent between the large horns, being therefore especially noticeable in two square patches on joints 6-7 and 9-10. Between these patches and the yellow subdorsal line is a slight space which will become the waved dark green line; but as yet it is not indicated. Yellow subdorsal line broad, irregular. In the lateral space the green pigment is situated in a band below the subdorsal line, separated from it by a space which is already defined faintly as a dark green line. The green pigment encloses the upper intersegmental whitish dots, but below this the body is only green from the blood. A narrow distinct whitish dorsal line. Horns greenish except the six red pairs. The short horns are as well spined as the long ones, in proportion. Skin finely watery granular. Length 5.3 to 7 mm.

Stage VI.—Elliptical, flattened, highest through joint 5, though not conspicuously so. Green, dorsum flat, not tapering much at the ends, yellowish green, a narrow yellow dorsal line and a dark clear green waved line above the subdorsal band; intersegmental glandular dots whitish; the green band is most pronounced on joints 6 to 10, giving the appearance of a central darker green patch, but this disappears under a lens. Subdorsal line rather broad, yellow, extending from joints 3 to 13. Horns short and slender, the longest ones on joints 3, 4, 5, 8, 11 and 12 bright red, the others moderate, colorless. Lateral space nearly colorless, shaded with light green on the lateral ridges between the depressed spaces, two rows of white glandular dots in the broad intersegmental hollows. Lateral horns rather long, alike, pale green, those on joints 3 and 4 tipped with brownish. A broken, pale lateral line. Subventral space contracted, colorless. Head green, jaws brown, ocelli black; width 1 mm. Spines colorless; skin with fine clear granules. Length of larva 7 to 10 mm.

Stage VII.—Essentially the same. There are now present a series of caltrops patches toward the tips of the lateral horns on joints 6 to 12, and on the subdorsal horn on joint 13. Width of head 1.6 mm. Length of larva 10 to 14.5 mm. The dark green lines adjoining the subdorsal and lateral ridges vary in distinctness in different larvæ, gradually becoming more distinct as the larvæ grow.

Stage VIII.—As before. The red horns vary in color in different examples, some being faintly colored or even greenish. A pair of pointed, slender, pale brown, black-tipped patches of detachable spines above the subdorsal horn of joint 13; caltrops patches pale

brown, on the upper side of the lateral horns of joints 6 to 12 and on the sides of the subdorsal horn of joint 13. Larva pale yellowish green, a yellow subdorsal band below the skin on joints 3 to 13, edged below by a dark green line, narrow, rarely partly replaced by red (Plate V, Fig. 3); a deeply waved green line above the subdorsal and lateral ridges, both edged with yellowish. Dorsal yellow line faint. Intersegmental glandular dots whitish. The subdorsal dark line is faint at the extremities, but gives no longer any appearance of a central patch. Skin sparsely watery granular. Width of head, about 2.5 mm.; length of larva, 14.5 to 20 mm.

Cocoon and pupa as usual. The cocoon is 11 x 6.5 mm. in size and is surrounded by a slight irregular web; color, dark brown.

Food Plants.—The larvæ were found each on a different plant, as follows: Mangrove (*Rhizophora mangle*), Sea Grape (*Coccoloba uvifera*), Cocoanut Palm and *Coccoloba floridana*. All the four larvæ produced moths; the last two mated in the box, and I obtained from them eggs and finally 95 little larvæ. These ate whatever was offered them, as is usual in the Eucleidæ.

EXPLANATION OF PLATE V.

- Fig. 1. Larva stage 1, lateral aspect, semidiagrammatic $\times 50$; head protruded.
 Fig. 2. Larva stage 1, dorsal aspect $\times 40$; head retracted.
 Fig. 3. Mature larva $\times 5$; three-quarters view, head retracted in the ordinary position of rest.
 Fig. 4. Outer part of a thoracic foot of mature larva $\times 200$ showing the claw and terminal setæ.
 Fig. 5. Jaw of same $\times 50$ seen from within.
 Fig. 6. Spiracle $\times 50$ showing radiate structure.
 Fig. 7. A simple seta and tubercle, mature larva, $\times 50$.
 Fig. 8. Another, showing the tubercle elongated.
 Fig. 9. The same, further advanced.
 Fig. 10. A short urticating spine, the seta reduced to the piercing cap, the tubercle forming the poison-holding shaft.
 Fig. 11. The same; a larger spine from a long horn.
 Fig. 12. One of the exceptional flattened setæ $\times 200$.
 Fig. 13. Leaf showing the feeding traces of the larva in stages II and III, natural size